

not include signals ordered at display stations where the velocity of the wind is only estimated. Of the above cautionary off-shore signals, forty-four were changed from cautionary. Three signals were ordered late. In twenty-eight cases, winds of twenty-five miles or more per hour were reported for which no signals were ordered.

COLD-WAVE SIGNALS.

During February, 1886, two hundred and sixty-eight cold-wave signals were ordered, of which number, two hundred and forty-seven, or 92.12 per cent., were justified.

RAILWAY WEATHER SIGNALS.

Prof. P. H. Mell, jr., director of the "Alabama Weather Service," in the report for February, 1886, states:

The verifications of predictions for the whole area was 91 per cent. for temperature, and 88 per cent. for weather.

The following corporations comprise this system: South and North; Montgomery and Mobile; Mobile and Girard; Georgia Pacific; East Tennessee, Virginia and Georgia system in Alabama; Memphis and Charleston; Columbus Western; Atlanta and West Point of Georgia; Northeastern of Georgia; Western and Atlantic; East Tennessee, Virginia and Georgia system in Georgia; Montgomery and Eufaula; Pensacola and Selma; Pensacola and Atlantic; and the City of Milledgeville, Georgia.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays occurred during February, as follows:

Escanaba, Michigan: an auroral arch of a pale orange color was observed above a faint segment at 11.18 p. m. of the 3d; beams were observed to shoot up from the ends of the arch; the display continued until 1.35 a. m. of the 4th.

Saint Vincent, Minnesota: an aurora was observed at 8.15 p. m. of the 3d; it first appeared as a pale diffused whitish light having an altitude of 20° and extending from 175° to 210° azimuth; at 10.15 p. m. numerous slender beams were observed, some of which attained an altitude of 30° ; the display continued until 2 a. m. of the 4th.

Manistique, Schoolcraft county, Michigan: a faint auroral light, having an altitude of 12° and extending from northwest to northeast, was observed at 7 p. m. of the 7th.

Fort Buford, Dakota: an aurora was observed at 9.18 p. m. of the 10th, consisting of an arch of a whitish color; when first observed it was about 20° above the horizon and rose slowly until at 11 p. m. it attained its maximum altitude, about 45° , and extended from northwest to northeast; a second arch, about 30° in altitude, formed below the first, from which several streamers rose to the upper arch. The lower arch gradually faded away after 11.20 p. m., the upper arch continuing until 11.53 p. m.

Bismarck, Dakota: a faint auroral light of a pale yellow color, extending from 135° to 225° azimuth and having an altitude of 20° and resting on a dark segment 15° in height, was observed at 11.35 p. m. of the 10th.

Burlington, Chittenden county, Vermont: an aurora was observed at 11.55 p. m. of the 10th, consisting of a bright yellow light rising above a bank of clouds in the northern horizon.

Fort Totten, Dakota: an auroral arch was observed from 9.15 p. m. of the 10th until 4.30 a. m. of the 11th, having an altitude of 20° and azimuth 100° .

Tiffin, Seneca county, Ohio: an aurora was observed at 3 a. m. of the 13th, of about 40° azimuth and having an altitude of 10° ; its illuminating effect was almost equal to that of dawn and was characterized by recurring fits of brilliancy.

Chincoteague, Virginia: an auroral arch was observed at 10.40 p. m. of the 17th lasting until 1.10 a. m. of the 18th; it extended from about 20° to 180° azimuth with an altitude of 45° ; the color was occasionally a brilliant yellowish white but most of the time a dull gray; during the last stages of the display there appeared to be two parallel bands of a grayish white which soon changed to a diffused light and faded away.

Cambridge, Middlesex county, Massachusetts: an aurora was suspected between 8 and 9 p. m. of the 22d.

Saint Vincent, Minnesota: a faint auroral light extending

from 175° to 260° azimuth with an altitude of 15° was observed at 9.45 p. m. of the 22d, the display lasting until after midnight.

Auroral displays were also observed during the month, as follows:

- 2d.—Mountainville, New York; Winnipeg, Manitoba.
- 3d.—Fort Totten, Dakota; Winnipeg, Manitoba; Montreal, Quebec.
- 5th.—Winnipeg, Manitoba.
- 6th.—Pekin, Illinois; Winnipeg, Manitoba.
- 7th.—Escanaba and Mackinaw City, Michigan; Webster, Dakota; Pekin, Illinois.
- 8th.—Pekin, Illinois.
- 9th.—New Westminster, British Columbia.
- 10th.—Moorhead, Minnesota; Poplar River, Montana; Webster and Richardson, Dakota.
- 11th, 12th, 16th.—Winnipeg, Manitoba.
- 22d.—Eastport and Kent's Hill, Maine; Winnipeg, Manitoba; Sydney, Nova Scotia.
- 24th.—Bar Harbor, Maine; Winnipeg, Manitoba.
- 28th.—Montreal, Quebec.

THUNDER-STORMS.

Thunder-storms were reported in the various states and territories, as follows:

- Alabama*.—Mobile, 3d.
- Arizona*.—Tucson, 25th, 26th; Fort Verde and Prescott, 22d; San Carlos, 23d; Yuma, 26th.
- Arkansas*.—Mount Ida, 2d; Little Rock, 10th, 14th.
- California*.—Cabuenga Valley, 2d, 25th; Red Bluff, 26th; Santa Barbara, 28th; Princeton, 27th.
- Colorado*.—West Las Animas and Colorado Springs, 27th.
- Florida*.—Pensacola, 3d.
- Georgia*.—Savannah, 3d.
- Illinois*.—Golconda and Philo, 11th; Bluffdale, 18th.
- Kansas*.—Independence, Yates Centre, Elk Falls, and El Dorado, 24th.
- Kentucky*.—Penrod, 11th.
- Louisiana*.—Liberty Hill, 2d; New Orleans, 3d; Grand Coteau, 2d, 10th; Shreveport, 2d, 9th, 10th.
- Maine*.—Eastport, 15th.
- Massachusetts*.—Somerset and Blue Hill Observatory, 15th.
- Michigan*.—Traverse City, 24th.
- Mississippi*.—Vicksburg, 2d, 3d, 10th, 11th.
- Missouri*.—Lamar, 9th; Carthage, 25th.
- New Hampshire*.—Mount Washington, 14th.
- New Jersey*.—Readington, 25th.
- New Mexico*.—Lava, 22d; Gallinas Spring, 23d; Puerto de Luna, 23d, 26th.
- North Carolina*.—Wilmington, Smithville, Fort Macon, and Hatteras, 3d; Weldon, 19th.
- Ohio*.—Columbus, 12th.
- Pennsylvania*.—Philipsburg, 19th.
- South Carolina*.—Charleston, 3d; Stateburg, 3d, 28th.
- Tennessee*.—Milan, 10th; Nashville, Grief, Parksville, and Hurricane Switch, 11th; Hohenwald and Trenton, 10th, 11th.
- Texas*.—El Paso, 1st; New Ulm, 1st, 27th; Galveston, 2d, 9th, 10th; Palestine, 9th, 10th; San Antonio, 10th, 23d; Brownsville, 21st; Fort Elliott, 23d, 24th.
- Vermont*.—Lunenburg, 14th; Strafford, 15th.
- Virginia*.—Bird's Nest, 25th.
- West Virginia*.—Parkersburg, 12th.

ELECTRICAL PHENOMENA.

Captain J. W. Cates, of the brig "Arcat," reports that at 9 a. m. of the 9th, when in latitude $23^{\circ} 20' N.$, longitude $83^{\circ} 25' W.$, a heavy storm of wind, rain, and lightning came from the north and northwest; at 10.15 a. m. a ball of lightning struck on the deck load of cedar and exploded, sending abundance of sparks in all directions. No shock was felt, although the captain and two others were standing within twenty feet of where the ball struck. There was no damage done nor any mark left.

